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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/069,945	09/19/2002	Petrus Basson	P.19477/MAJR	4581

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EXAMINER	
WILKINS III, HARRY D	

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 03/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)
	10/069,945	BASSON ET AL.
	Examiner	Art Unit
	Harry D Wilkins, III	1742

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 February 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *50-65 and 67-81* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *50-65 and 67-81* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 March 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejection Status

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

2. The rejection grounds based on Emmett, Jr et al in view of Applicant's admission and Eppstein et al has been withdrawn in view of Applicant's amendment changing the range of oxygen in the feed gas and Applicant's data in the specification. However, new grounds of rejection are applied in view of Whellock et al (GB 2,225,256, already of record).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 50, 67-69, 71-73, 80 and 81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Emmett, Jr et al (US 5,007,620) in view of Applicant's admission of prior art and Eppstein et al (US 4,680,267) and Whellock et al (GB 2,225,256).

Emmett, Jr et al teach (see abstract) a method of recovering a metal (zinc, see col. 1, lines 61-64) from a metal bearing sulfide mineral slurry, including the steps of subjecting the slurry in a reactor to a bioleaching process at temperatures up to 46°C (see col. 21, lines 10-26), supplying a feed gas containing oxygen (air, see fig. 22, which contains 21% oxygen), and recovering metal from the bioleach residue (see col. 1, lines 38-60).

Thus, Emmett, Jr. et al do not teach (1) the step of controlling the dissolved oxygen concentration in the slurry to a desired level by controlling at least one of the oxygen content of the feed gas, the supply of feed gas or the rate of feed of slurry or (2) the feed gas containing oxygen contains at least 85% oxygen.

Applicant admits as prior art (see paragraphs 3-6) that the amount of oxygen in the slurry is the rate limiting variable of the bioleaching process when conducted above 40°C.

Eppstein et al teach (see abstract) control means for adjusting the dissolved oxygen concentration in a bioreactor, which is measured by an oxygen sensor, that controls the oxygen content of the feed gas.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the controlling step of Eppstein et al to the method of Emmett, Jr et al because Applicant's admission teaches that dissolved oxygen controls the rate of the reaction

and the controlling step of Eppstein et al can control the dissolved oxygen level to a desired high amount to facilitate the reaction.

Whellock et al teach (see abstract, figures, page 2, lines 14-31 and page 6, line 19 to page 7, line 12) a method for improving oxygen usage in a bioleach process by gasifying a slurry to form a foam. The process includes feeding pure oxygen and is able to function at low concentrations of oxygen (0.5-0.6 mg/L = 0.5-0.6 x 10^{-3}kg/m^3) but still provides increased oxygen uptake rates due to improved mass transfer of the oxygen gas.

Therefore, it would have been obvious to one of ordinary skill in the art to have modified the method of Emmett, Jr. et al to include the gasifying of Whellock et al for the purpose of feeding pure oxygen at low concentrations to improve oxygen take up rates thereby improving the overall reaction rate as taught by Whellock et al.

Regarding the actual concentration of dissolved oxygen in the slurry, it would have been within the expected skill of a routineer in the art to have optimized the concentration of oxygen in the slurry in order to maximize the reaction rate. Emmett, Jr. et al describe (see figs. 24 and 28) oxygen concentrations ranging from 1 to 4 mg/L (1.0 x 10^{-3} kg/m^3 to 4.0 x 10^{-3} kg/m^{-3}).

Regarding claims 67 and 68, Emmett, Jr. et al do not expressly teach controlling the carbon content of the slurry. However, as the carbon content directly relies on the carbon dioxide present in the slurry, and the carbon dioxide affects the bioleach process, it would have been obvious to one of ordinary skill in the art to have controlled the amount of carbon in the slurry. Means similar to the oxygen control of Eppstein et al

would have been utilized. It would have been within the expected skill of a routineer in the art to have found the optimum amount of carbon dioxide in the feed gas for producing the best bioleaching results.

Regarding claims 69 and 71, Emmett, Jr. et al teach (see col. 21, lines 10-26) performing the bioleaching at up to 46°C using mesophile microorganisms.

Regarding claims 72 and 73, Emmett, Jr. et al are silent as to the actual bacterium utilized in the process. However, it would have been within the expected skill of a routineer in the art to have selected an appropriate bacterium for performing the operation, such as *Thiobacillus prosperus*.

Regarding claim 80, Emmett, Jr. et al teach (see fig. 22) a plant for recovering zinc that includes a reactor vessel (232), a source which feeds the slurry to the vessel, an oxygen source (air compressor) supplying gas to the slurry, and a recovery system to recover zinc from the bioleach residue. Thus, Emmett, Jr. et al fail to teach the device that measures the dissolved oxygen concentration and the control mechanism.

Applicant admits as prior art (see paragraphs 3-6) that the amount of oxygen in the slurry is the rate limiting variable of the bioleaching process when conducted above 40°C.

Eppstein et al teach (see abstract) control means for adjusting the dissolved oxygen concentration in a bioreactor, which is measured by an oxygen sensor, that controls the oxygen content of the feed gas.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the oxygen sensor and control means of Eppstein et al to the plant of Emmett, Jr

et al because Applicant's admission teaches that dissolved oxygen controls the rate of the reaction and the oxygen sensor and control means of Eppstein et al can control the dissolved oxygen level to a desired high amount to facilitate the reaction.

It would have been obvious to one of ordinary skill in the art to have fed pure oxygen gas to the reactor as taught by Whellock et al (see above) in order to improve the reaction rate of the bioleaching process.

Regarding claim 81, regarding the limitations that the reactor vessel is operated at temperature in excess of 60°C, the above limitations are not further limiting on the apparatus claim because the above limitation deals with the manner or method of use of the claimed apparatus. It has been well settled that the manner or method of use of an apparatus cannot be relied upon to further limit claims to the apparatus itself. See In re Casey, 152 USPQ 235, and MPEP 2114.

6. Claims 51-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Emmett, Jr et al (US 5,007,620) in view of Applicant's admission of prior art and Eppstein et al (US 4,680,267) as applied to claims 50, 67-69, 71-73, 80 and 81 above, and further in view of Steemson et al (WO 94/28184).

Regarding claims 51-53, Emmett, Jr et al do not teach the steps of removing copper or iron from the bioleach residue before recovering zinc. However, Steemson et al teach (see fig. 1) a similar bioleach process that includes removing copper and iron from the bioleach residue before recovering zinc. It would have been obvious to one of ordinary skill in the art to have removed copper and iron from the bioleach residue in

order to ensure a purer zinc product. Steemson et al teach (see fig. 1) removing the iron by adding limestone.

Regarding claims 54, 56, 57 and 58, Emmett, Jr et al do not teach the steps of subjecting the bioleach residue to a recovery process that includes zinc solvent extraction and zinc electrowinning to produce zinc cathodes. However, Steemson et al teach (see fig. 1) a similar bioleach process that includes a recovery process that includes zinc solvent extraction and zinc electrowinning to produce zinc cathodes. It would have been obvious to one of ordinary skill in the art to have performed the recovery process of Steemson et al in order to ensure a pure zinc product. Steemson et al also teach recycling the zinc raffinate to the bioleaching process. Steemson et al also teach including neutralizing acid (lime/limestone) in the raffinate to produce gypsum. This would inherently also produce CO_2 and precipitate co-leached iron.

Regarding claim 55, it would have been obvious to one of ordinary skill in the art to have recycled the oxygen generated during electrowinning to the bioleach reactor in order to avoid wasting pure oxygen to the atmosphere.

Regarding claim 59, it would have been obvious to one of ordinary skill in the art to have recycled the carbon dioxide generated during neutralizing to the bioleach reactor in order to avoid wasting pure carbon dioxide to the atmosphere.

Regarding claims 60, 61, 63 and 64, Emmett, Jr et al do not teach the steps of subjecting the bioleach residue to an electrowinning step to produce zinc cathodes. However, Steemson et al teach (see fig. 1) a similar bioleach process that includes an electrowinning step to produce zinc cathodes. It would have been obvious to one of

ordinary skill in the art to have performed the electrowinning step of Steemson et al in order to ensure a pure zinc product. Steemson et al also teach recycling the spent electrolyte to a zinc oxide leach stage. Steemson et al also teach neutralizing the electrolyte with limestone to produce gypsum. This would inherently also produce CO_2 and precipitate co-leached iron.

Regarding claim 62, it would have been obvious to one of ordinary skill in the art to have recycled the oxygen generated during electrowinning to the bioleach reactor in order to avoid wasting pure oxygen to the atmosphere.

Regarding claim 65, it would have been obvious to one of ordinary skill in the art to have recycled the carbon dioxide generated during neutralizing to the bioleach reactor in order to avoid wasting pure carbon dioxide to the atmosphere.

7. Claims 70 and 74-79 are rejected under 35 U.S.C. 103(a) as being unpatentable over Emmett, Jr et al (US 5,007,620) in view of Applicant's admission of prior art and Eppstein et al (US 4,680,267) as applied to claims 50, 67-69, 71-73, 80 and 81 above, and further in view of Hutchins et al (US 4,729,788).

Emmett, Jr. et al teach using mesophilic microorganisms for the bioleach process. Thus, Emmett, Jr. et al fail to meet the temperature range of 60-85°C or moderate thermophile microorganisms. Hutchins et al teach (see abstract and col. 3, line 52-col. 4, line 33) using thermophile microorganisms at 45-90°C for the decomposition of metal sulfide ores. Therefore, it would have been obvious to one of ordinary skill in the art to have substituted the thermophile microorganisms of Hutchins et al for the mesophilic microorganisms of Emmett, Jr. et al because the thermophiles

have the advantage of being more heat resistant to withstand the exothermic bioleach process (see col. 2, lines 23-30). Hutchins et al teach (see col. 4, lines 8-15) using *acidophilic sulfolobus* species of bacterium.

Response to Arguments

8. Applicant's arguments with respect to claims 50-65 and 67-81 have been considered but are moot in view of the new ground(s) of rejection. Particularly, Applicant's asserted unexpected results regarding the oxygen uptake rate when using substantially pure oxygen were not unexpected as evidenced by Whellock et al.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-Th 10am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw

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